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June 14, 2017

Via Electronic Filing

Marlene H. Dortch, Secretary
Federal Communications Commission
445 Twelfth Street, SW
Washington, DC 20554

Re: *Ex Parte Notice: TerreStar Corporation Request for Temporary Waiver
of Substantial Service Requirements* – WT Docket No. 16-290

Dear Ms. Dortch:

On June 12, 2017, Douglas Brandon, Secretary of TerreStar Corporation (“TerreStar”), John Dooley of Jarvinian Advisors LLC, Steve Berman of Lawler, Metzger, Keeney & Logan, LLC, and I met with Chairman Ajit Pai, Rachael Bender, Wireless and International Advisor to Chairman Pai, and Jay Kaplan from the Office of Chairman Pai, regarding TerreStar’s above-captioned request for temporary waiver of its substantial service requirements in the commercial 1.4 GHz band.¹ During this meeting, TerreStar’s representatives described the unique circumstances TerreStar faced in its multi-year effort to identify the best and safest use of its 1.4 GHz licenses, its pending request for relief, and its planned wireless medical telemetry use of its spectrum.² As explained at our meeting and in TerreStar’s filings in this proceeding, grant of TerreStar’s request meets the Federal Communications Commission’s (“Commission’s”) criteria for temporary waiver under Section 1.925(b)(3) of the Commission’s rules, as well as its criteria for an extension of time under Section 1.946(e) of those rules.³ A grant will facilitate TerreStar’s

¹ TerreStar Corporation Request for Temporary Waiver of Substantial Service Requirements, WT Docket No. 16-290 (Aug. 12, 2016); *Wireless Telecommunications Bureau Seeks Comment Regarding TerreStar Corporation’s Request for Relief of Certain 1.4 GHz Construction Requirements*, Public Notice, 31 FCC Rcd 9798 (2016). See also Supplemental Comments of TerreStar Corporation, WT Docket No. 16-290 (June 7, 2017) (“TerreStar Supplemental Comments”).

² During our meeting, we provided the Chairman and his staff a copy of the attached slide presentation.

³ Licensees may request additional time to provide substantial service pursuant to a waiver of the applicable construction requirement under Section 1.925(b)(3) of the Commission’s rules,

rapid deployment of this beneficial medical telemetry service, enabling more efficient use of its spectrum without causing interference to WMTS and other spectrum neighbors.⁴

TerreStar appreciates the Commission's recent reminder to commercial wireless licensees regarding their obligation to timely meet their construction and coverage deadlines, and it values the Commission's commitment to ensuring that scarce spectrum resources are put to use and deployed in a manner that serves all communities.⁵ As discussed in our meeting, TerreStar's request for relief involves a unique set of circumstances that is not present in any other commercial wireless band. As expanded upon below, these special factors include (i) the adjacency of TerreStar's spectrum with the life-critical, highly sensitive 1.4 GHz Wireless Medical Telemetry Service ("WMTS"), (ii) the extraordinary public interest benefits that a waiver will generate for millions of patients in hospitals and other health care facilities across the nation, and (iii) TerreStar's agreement to detailed milestones throughout the temporary waiver period. Given this unique combination of factors, a grant of TerreStar's request will not set a precedent for substantial service waivers or extensions in different, less compelling scenarios.

- 1. First, TerreStar is the only commercial wireless licensee with licenses directly adjacent to spectrum dedicated to WMTS, a life-critical service that is highly susceptible to interference. Commercial duplex wireless operations are currently not possible in the 1.4 GHz band without causing a severe, detrimental impact on patients at hospitals and other health care facilities across the United States.***

After emerging from bankruptcy in early 2013, TerreStar's new owners began executing plans for the widespread deployment of a high-power 802.16 WiMAX network for use in smart-grid applications. At that time, demand for licensed smart-grid services was forecast to grow rapidly throughout the United States, with utilities seeking to use 4G wireless technology to

or pursuant to the extension of time criteria in Section 1.946(e) of the rules. *See* 47 C.F.R. §§ 1.925(b)(3), 1.946(e). If a licensee satisfies the criteria for a waiver of its substantial service requirement, the Bureau need not reach its request for extension under Section 1.946(e). *See Maritime Communications/Land Mobile, LLC, Debtor-in-Possession*, Order, FCC File Nos. 0007603776-79; FCC File No. 0005552500, DA 17-450, ¶ 15 n.50 (WTB rel. May 11, 2017) (granting two-year waiver of Part 80 substantial service requirement for Automated Maritime Telecommunications System licenses).

⁴ *See, e.g., AT&T Mobility Spectrum LLC, BellSouth Mobile Data, Inc., New Cingular Wireless PCS, LLC, and SBC Telecom, Inc., Petition for Limited Waiver of Interim Performance Requirement for 2.3 GHz WCS C and D Block Licenses*, Order, WT Docket No. 16-181, DA 17-78, ¶ 1 (WTB rel. Jan. 18, 2017) (granting full waiver from Part 27 interim construction requirement for 2.3 GHz Wireless Communications Service C and D Block licenses nationwide and two-year waiver of final construction requirement for those licenses).

⁵ *See Wireless Telecommunications Bureau Reminds Wireless Licensees of Construction Obligations*, Public Notice, DA 17-573, at 2-4 (WTB rel. June 12, 2017).

optimize operational efficiency, enable consumer participation, and enhance overall reliability, security, and quality of their services.⁶ Notably, manufacturers and other vendors had already developed a significant WiMAX device and infrastructure ecosystem for utilities' smart-grid operations in the commercial 1.4 GHz band.⁷ Based on industry demand and the existence of this ecosystem, TerreStar believed in early 2014 that it could meet its substantial service requirements at 1.4 GHz through a robust national deployment of smart-grid WiMAX facilities.⁸

As part of its WiMAX implementation efforts, TerreStar in late 2013 reached out to representatives from the WMTS industry in order to identify any potential technical issues related to TerreStar's planned smart-grid deployments in 1.4 GHz spectrum directly adjacent to WMTS.⁹ These WMTS representatives all expressed concern that high-power, smart-grid WiMAX operations in the commercial 1.4 GHz band would cause significant harmful interference to adjacent-band medical telemetry systems already deployed and operating at 1395-1400 MHz and 1427-1431.5 MHz. In response, TerreStar instructed its technical consultant, Jarvinian Advisors ("Jarvinian"), to evaluate the risk of interference to WMTS, in cooperation with WMTS interests. Jarvinian's laboratory and field tests during the first half of 2014 confirmed that, even if compliant with the Commission's rules, smart-grid WiMAX operations in TerreStar's licensed spectrum

⁶ See The Smart Grid Market 2012-2022, VISIONGAIN, <https://www.marketresearch.com/product/sample-6917022.pdf> (providing smart grid market forecast as of 2012).

⁷ See *Airspan Networks for Smart Utility Communication in 1.4 GHz: Smart Utility Communication in 1.4 GHz*, AIRSPAN, <http://www.distrodoc.com/371301-airspansmartgrids1400brochure-2>; see also *Cisco Connected Grid WIMAX Modules for the Cisco 1000 Series Connected Grid Router*, CISCO, <http://www.cisco.com/c/en/us/products/collateral/routers/1000-series-connected-grid-routers/datasheet-c78-730623.pdf>.

⁸ The market potential of a smart-grid WiMAX network was demonstrated at that time by TerreStar's earlier May 2012 spectrum lease arrangement with FirstEnergy Service Company ("FirstEnergy"), a large electrical utility. (TerreStar entered into the lease arrangement with FirstEnergy in May 2012, prior to the conclusion of the company's bankruptcy proceeding and the emergence of new controlling interests.) This lease agreement permitted FirstEnergy to deploy high-power 802.16 WiMAX facilities for smart grid applications in two EAG license areas in the 1.4 GHz A and B Blocks. FirstEnergy's Smart Grid Modernization Initiative project included deployment of advanced metering infrastructure, distribution automation assets, time-based rate programs, load control, and customer systems in New Jersey, Ohio, and Pennsylvania. TerreStar's 1.4 GHz spectrum was a critical part of the communications infrastructure for this project, enabling data to be wirelessly transmitted between smart grid systems and pole-mounted concentrators. An overview of FirstEnergy's Smart Grid Modernization Initiative Project can be found at https://www.smartgrid.gov/files/Fact_Sheet_FirstEnergy_Smart_Grid_Modernization_Initiative_201103.pdf.

⁹ These representatives included engineers from equipment vendors Philips Healthcare and GE Healthcare and officials from the American Society for Healthcare Engineering ("ASHE") of the American Hospital Association.

would likely have a significant, deleterious impact on existing life-critical WMTS devices and systems at health care facilities across the United States.

As Jarvinian found in its tests, the vulnerability of adjacent-band WMTS to harmful interference stems from the low-power nature of medical telemetry devices. To extend battery life and to ensure that patients can comfortably wear monitoring devices as they move around health care facilities, medical telemetry devices are designed to transmit at extremely low power levels. To function effectively at such power levels, WMTS receivers must be highly sensitive and utilize wide passband filters that offer little protection from adjacent-band operations. As a result, even fully compliant 802.16 WiMAX systems would create enough emissions in WMTS passbands to interfere with real-time patient telemetry. This problem is particularly acute in the case of mobile WiMAX device operations, where the emission source can be physically close to the WMTS receiver.

Thus, by mid-2014, TerreStar had become aware that, due to this unique spectrum adjacency, a robust WiMAX network at 1.4 GHz would likely threaten patient safety at the nearly 2000 registered health care facilities that currently use dedicated 1.4 GHz WMTS spectrum for life-critical patient monitoring, even if the network complied with all Commission rules.¹⁰ During that period, TerreStar worked closely with WMTS interests to identify any potential technical solutions to this interference problem. This effort was unsuccessful, however,¹¹ and Jarvinian and the WMTS vendors ultimately concluded that a bi-directional 802.16 WiMAX system, although permitted under the Commission's rules, was fundamentally incompatible with adjacent-band, real-world WMTS receivers.

In its continuing effort to develop its licensed spectrum while safeguarding WMTS and the millions of patients who rely on that service, TerreStar by mid-2014 focused on downlink-only wireless operations as an alternative deployment approach at 1.4 GHz. The outcome of Auction 97 in early 2015, however, meant that TerreStar's licensed 1.4 GHz spectrum could not

¹⁰ The technical specifications of WMTS equipment are generally not publicly available, and it was not possible for TerreStar to understand the degree of interference sensitivity of this equipment until its cooperative discussions and efforts with the WMTS industry as well as its resulting access to WMTS devices and systems.

¹¹ Jarvinian and WMTS representatives discussed the possibility of adding filtration to WMTS devices – Jarvinian even designed and built an appropriate filter at substantial cost – but ultimately this option was neither logistically nor economically feasible and would likely have resulted in impaired WMTS functionality. The parties also rejected commercial wireless exclusion zones around registered WMTS facilities, since such operational constraints in and around approximately 3800 health care locations (a number that includes facilities operating at 1.4 GHz and/or 600 MHz and is expected to grow in the future) would undercut the economic viability of any commercial service in TerreStar's spectrum.

be paired with suitable mobile transmit spectrum within the near term.¹² Given this fact, and with neither WiMAX nor standalone LTE operations at 1.4 GHz currently possible due to the vulnerability of adjacent-band WMTS to interference, TerreStar reassessed its deployment options at 1.4 GHz during the course of 2015.

After additional internal analysis and discussions with WMTS interests, TerreStar in September 2015 determined to move forward with its plan for wireless medical telemetry use of its licensed 1.4 GHz spectrum. In making this decision, TerreStar recognized not only the urgent need for additional WMTS capacity, but also the fact that the enormous installed base of WMTS equipment could be converted for operations in the commercial 1.4 GHz band. The convertibility of this equipment is due to the same unique factor that has so far prevented more conventional commercial wireless operations in this spectrum – the adjacency of TerreStar’s spectrum with WMTS.¹³ Based on the likely efficiency of such a deployment and the rapidly growing demand for patient monitoring, TerreStar concluded that wireless medical telemetry operations at 1.4 GHz band will generate commercial and public interest benefits far greater than those from any other presently feasible use of this band.¹⁴

In sum, due to TerreStar’s unique adjacency to highly sensitive, safety-of-life WMTS operations, TerreStar was effectively precluded from meeting its April 23, 2017 substantial service deadline. Given current technology, any commercial wireless deployment since 2013 would have likely compromised patient safety at health care facilities around the United States, even if TerreStar’s network complied with all Commission rules. TerreStar was determined to avoid this detrimental health care outcome and the resulting, severe public interest harm. The technical realities stemming from this spectrum adjacency weigh in favor of a grant of its August 2016 request for relief, which will provide it with the necessary time to implement wireless medical telemetry operations at 1.4 GHz.

¹² See TerreStar Supplemental Comments at 18-19.

¹³ As designed and manufactured, many WMTS devices have front-end passband filters sufficiently wide that, with the appropriate firmware modification, this equipment can operate on spectrum adjacent to the dedicated WMTS spectrum at 1395-1400 MHz and between 1427-1431.5 MHz. Once TerreStar and manufacturers complete the required equipment re-certification process (typically a twelve to eighteen month process), these devices will be able to operate on TerreStar’s licensed bands at 1390-1395 MHz and 1432-1435 MHz.

¹⁴ Since the fall of 2015, TerreStar has been actively preparing for WMTS deployment by working cooperatively with WMTS equipment vendors and related industry interests on essential engineering issues, including the conversion of existing device ecosystems on current networks and the integration of TerreStar’s licensed spectrum into next-generation network hardware. The use of TerreStar’s spectrum for wireless medical telemetry is firmly in the product roadmap for these vendors. During this period, TerreStar has also worked to develop the equipment registration and access process for this use of its spectrum, as well as commercial test beds to ensure the safety and compliance of medical telemetry operations in this band.

2. *Second, unlike other waivers and extension that primarily benefit the licensee, grant of the requested relief in this case will generate critical health care benefits for millions of patients in hospitals and other health care facilities across the United States.*

Most construction waivers and extensions granted by the Commission primarily benefit the wireless licensees who are consequently able to retain their licenses. While TerreStar certainly hopes to benefit from a grant of its request, such action will also yield extraordinary health care benefits for millions of patients in hospitals and other health care facilities across the nation. This crucial distinction weighs heavily in favor of a grant of TerreStar's request.

As TerreStar has described in this proceeding, the development of wireless medical telemetry over the past three decades has yielded enormous health care benefits. The reliability of these life-critical transmissions could be jeopardized in the coming years, however, by a shortage of spectrum for this service. Demand for remote patient monitoring in American hospitals and other health care facilities will likely continue to increase significantly over the next decade as the U.S. patient population ages and experiences frequent and acute medical problems.¹⁵ Health care providers will respond by deploying additional wireless medical telemetry devices within their facilities, potentially resulting in spectrum congestion and disrupted transmissions. While this threat is already real, no other source of additional, dedicated wireless medical telemetry spectrum has been identified to alleviate this spectrum shortage and address the growing risk of interference to WMTS.¹⁶

In the face of this growing interference threat, grant of TerreStar's request is a ready pathway to ensuring the reliability and security of wireless medical telemetry operations. As we described in the meeting, because TerreStar's spectrum is adjacent to the WMTS frequencies already dedicated to wireless medical telemetry, this action will enable TerreStar to efficiently make available five additional megahertz of spectrum for wireless medical telemetry on a nationwide basis in hospitals and other health care facilities, an approximately 67% increase in capacity at 1.4 GHz. This capacity would be available for existing medical telemetry equipment via a firmware update (and equipment certification), as well as for future equipment. With this expanded capacity, hospitals and health care providers will avoid spectrum exhaustion and congestion while deploying telemetry devices more densely and utilizing new and innovative

¹⁵ In addition, the types of biometric data transmitted over wireless medical telemetry systems will expand with advances in medical technology, adding significantly more bandwidth demand per patient.

¹⁶ Chairman Pai has pointed out that in health care environments "[h]armful interference could have serious and immediate consequences," since "WMTS can involve matters of life and death." *Amendment of Part 15 of the Commission's Rules for Unlicensed Operations in the Television Bands, Repurposed 600 MHz Band, 600 MHz Guard Bands and Duplex Gap, and Channel 37, et al.*, Report and Order, 30 FCC Rcd 9551, 9733, at Statement of Commissioner Ajit Pai (2015).

applications. By advancing the development of wireless medical telemetry, a grant of TerreStar's requested relief will significantly enhance the standard of patient care at health care facilities around the United States.¹⁷

The developmental use of TerreStar's licensed spectrum for medical telemetry applications *outside* health care facilities will also yield substantial public interest benefits, particularly in rural areas. While existing WMTS systems can only be operated within hospitals and other health care facilities,¹⁸ this restriction will not apply to TerreStar's operations in the commercial 1.4 GHz band. The operation of medical telemetry devices in mobile settings such as ambulances should produce significant improvements in emergency medical care. In rural settings, for example, the ability to monitor wirelessly while transporting patients long distances to hospitals will be a significant benefit.¹⁹ Medical telemetry in residences, nursing homes, and rehabilitation centers will provide significant benefits to patients, who increasingly rely on medical treatment in residential and other similar environments and require real-time monitoring. In addition, research and development of wireless medical telemetry equipment promises to stimulate innovation and the development of new medical telemetry applications. Significantly, rural telemedicine applications could benefit patients in rural and remote areas with the greatest need for improved medical care and treatment.²⁰

¹⁷ See WT Docket No. 16-290, Comments of GE Healthcare (Oct. 4, 2016); Letter from Delroy Smith, Philips Healthcare, to Marlene H. Dortch, FCC (Oct. 4, 2016); Reply Comments of Philips Healthcare (Oct. 14, 2016); Letter from Lawrence Movshin, Counsel to ASHE, to Amanda Huetinck, FCC (Nov. 10, 2016); Comments of the American Society for Healthcare Engineering of the American Hospital Association, GN Docket No. 16-46, at 12-13 (May 24, 2017); Comments of GE Healthcare, GN Docket No. 16-46, at 6-7 (May 24, 2017).

¹⁸ See 47 C.F.R. § 95.1107.

¹⁹ TerreStar's wireless medical telemetry operations under Part 27 should also improve rural medical care by enhancing patient treatment in clinical settings not formally categorized as health care facilities and by permitting remote monitoring of patients at residences and other locations that are too remote to be staffed by specialists.

²⁰ See, e.g., *FCC Seeks Comment on Data on Actions to Accelerate Adoption and Accessibility of Broadband-Enabled Health Care Solutions and Advanced Technologies*, GN Docket No. 16-46, Public Notice, FCC 17-46, at 6-8 (rel. Apr. 24, 2017) (identifying "some of the opportunities that . . . health-related communications technologies and devices offer, especially for those living in rural and underserved areas, low density populations, and Tribal lands").

3. *Third, TerreStar has agreed to detailed interim and final performance milestones that will (i) require TerreStar to follow through quickly to build out its spectrum and (ii) enable the Commission to terminate TerreStar's 1.4 GHz licenses early in this process in the event of insufficient progress by TerreStar.*

Earlier this year, TerreStar's representatives engaged in extended discussions with Bureau staff regarding potential conditions on an order that would give TerreStar an additional 36 months to meet its substantial service requirements.²¹ At the conclusion of these discussions, TerreStar agreed to performance milestones relating to the modification, testing, certification, and deployment of wireless medical telemetry equipment and devices operating at 1.4 GHz.²² Specifically, these milestones included the following:

- Completion of wireless medical telemetry ecosystem in TerreStar's licensed 1.4 GHz spectrum, through expansion of frequency range of a sufficient number of WMTS devices, by January 2018.
- Completion of safety and efficacy testing for a sufficient number of wireless medical telemetry devices operating in TerreStar's spectrum by April 2018.
- Completion of the equipment certification process for wireless medical telemetry equipment operating in TerreStar's spectrum by October 2018.
- Trial deployment of wireless medical telemetry in TerreStar's spectrum at 50 health care facilities by March 2019.
- Full-scale deployment of wireless medical telemetry in TerreStar's spectrum at 2000 health care facilities by April 2020.²³

²¹ As explained in its prior filings, TerreStar's robust national deployment of wireless medical telemetry at 1.4 GHz involves several complex developmental phases that, while overlapping, will likely take three years or more to complete industry-wide. Thus, any order adopted by the Bureau must account for the fact that wireless medical telemetry operations in TerreStar's licensed 1.4 GHz spectrum – and the resulting public interest benefits – are possible only if TerreStar and future partners have sufficient time and regulatory certainty to deploy these systems.

²² See Letter from Regina M. Keeney, Counsel to TerreStar Corporation, to Marlene H. Dortch, FCC Secretary, WT Docket No. 16-290 (Apr. 4, 2017).

²³ This final deployment milestone is an aggressive threshold, given that there are currently fewer than 2000 hospitals nationwide that utilize the 1.4 GHz band for wireless medical telemetry.

By applying these interim and final milestones, the Bureau will compel TerreStar to put its spectrum into use quickly. In addition, strict application of these milestones would enable the Commission to take back TerreStar's spectrum relatively early during its three-year waiver period in the event TerreStar failed to make sufficient deployment progress. With this framework in place, the Commission would not be placed in a position – nor should it – of having to wait until the latter stages of this waiver period before assessing TerreStar's compliance efforts, when patients around the United States would already be benefitting from increased wireless medical telemetry capacity at 1.4 GHz.

Thus, in contrast to other commercial wireless licensees that receive a construction waiver or extension and then avoid scrutiny until their new deadline draws close, TerreStar would face milestones that require it to promptly and repeatedly demonstrate its ongoing progress in implementing wireless medical telemetry in its spectrum. This factor also weighs in favor of a grant of TerreStar's requested relief.

* * *

TerreStar respectfully urges that its request be granted expeditiously, in order to yield the extraordinary public interest benefits described at length in this proceeding. Given the unique factors involved in this proceeding, TerreStar has satisfied the Commission's criteria for a grant of its requested relief in the commercial 1.4 GHz band. Grant of TerreStar's request, with appropriate terms, conditions, and milestones, will advance the development of wireless medical telemetry at 1.4 GHz and improve patient care at health care facilities throughout the United States.

Pursuant to section 1.1206(b)(2) of the Commission's rules, 47 C.F.R. § 1.1206(b)(2), this *ex parte* notification and the attached slide presentation are being filed electronically for inclusion in the public record of the above-referenced proceeding.

Respectfully submitted,

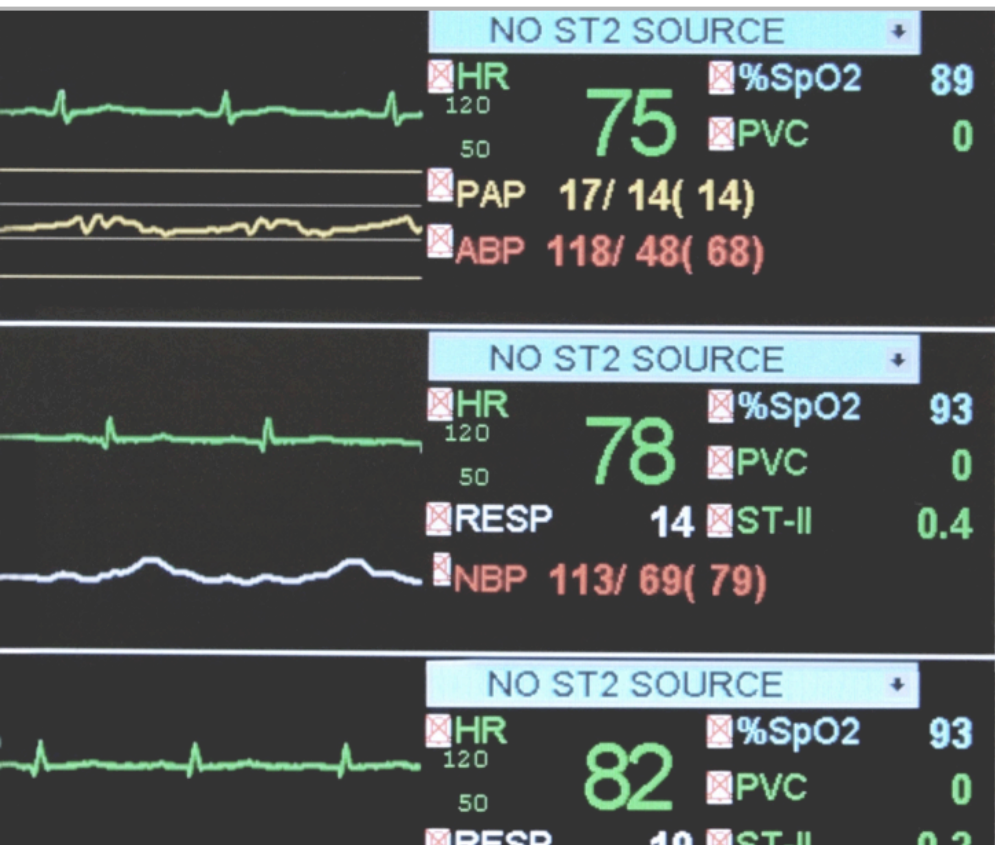
/s/ Regina M. Keeney

Regina M. Keeney

Attachment

cc: Chairman Ajit Pai
Rachael Bender
Jay Kaplan

TerreStar[®]



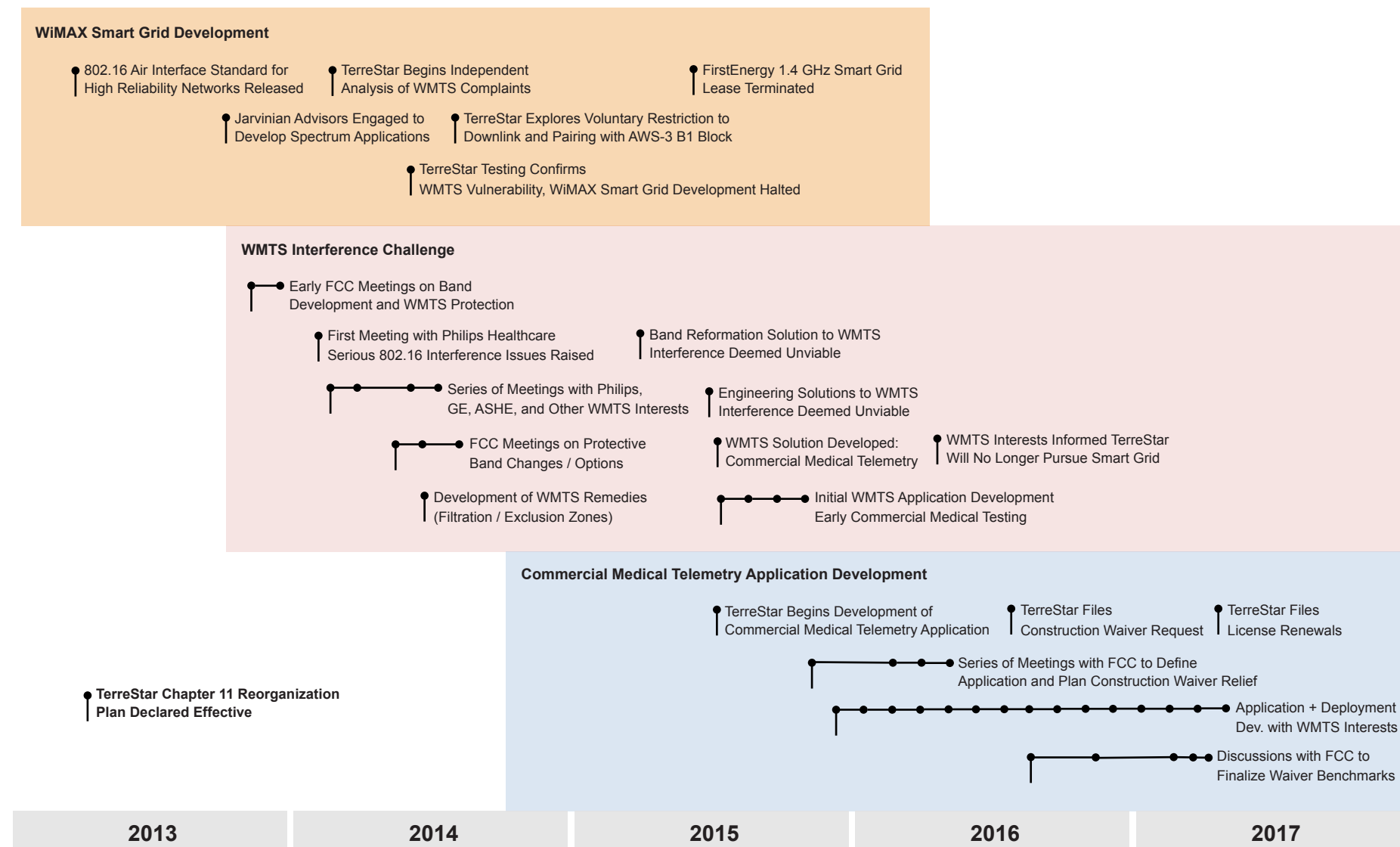
TerreStar and Medical Telemetry

Summary

- **Original Application:** TerreStar emerged from bankruptcy with a fully developed ability to deploy WiMAX Smart Grid systems.
- **Medical Telemetry Interference Concerns:** Wireless Medical Telemetry Service (WMTS) interests alerted TerreStar that 802.16 WiMAX Smart Grid operations would present a significant danger to patient safety.
- **Innovative Solution in the Public Interest:** TerreStar worked diligently with WMTS interests and the FCC to arrive at a viable technical solution, and this resulted in a wireless medical telemetry application for commercial 1.4 GHz.
- **Urgent Need for Regulatory Relief:** With the requested waiver, the wireless medical telemetry application at 1.4 GHz will safeguard WMTS, while quickly adding much needed capacity and functionality to medical telemetry networks.

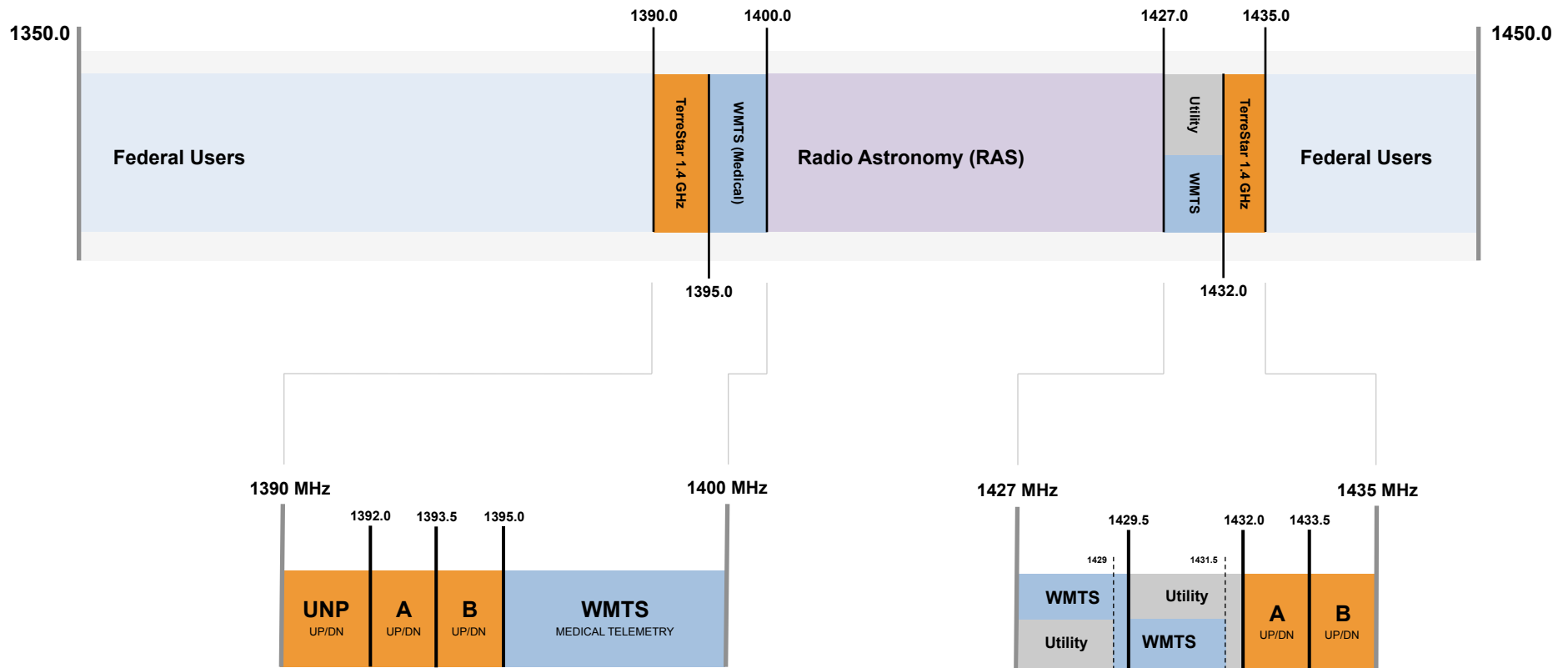
TerreStar Corporation Post-Reorganization

Emerging from bankruptcy in 2013 with a fully developed ability to deploy WiMAX Smart Grid systems, TerreStar deployment was halted by serious WMTS patient safety concerns. The commercial medical telemetry application emerged as an innovative solution.



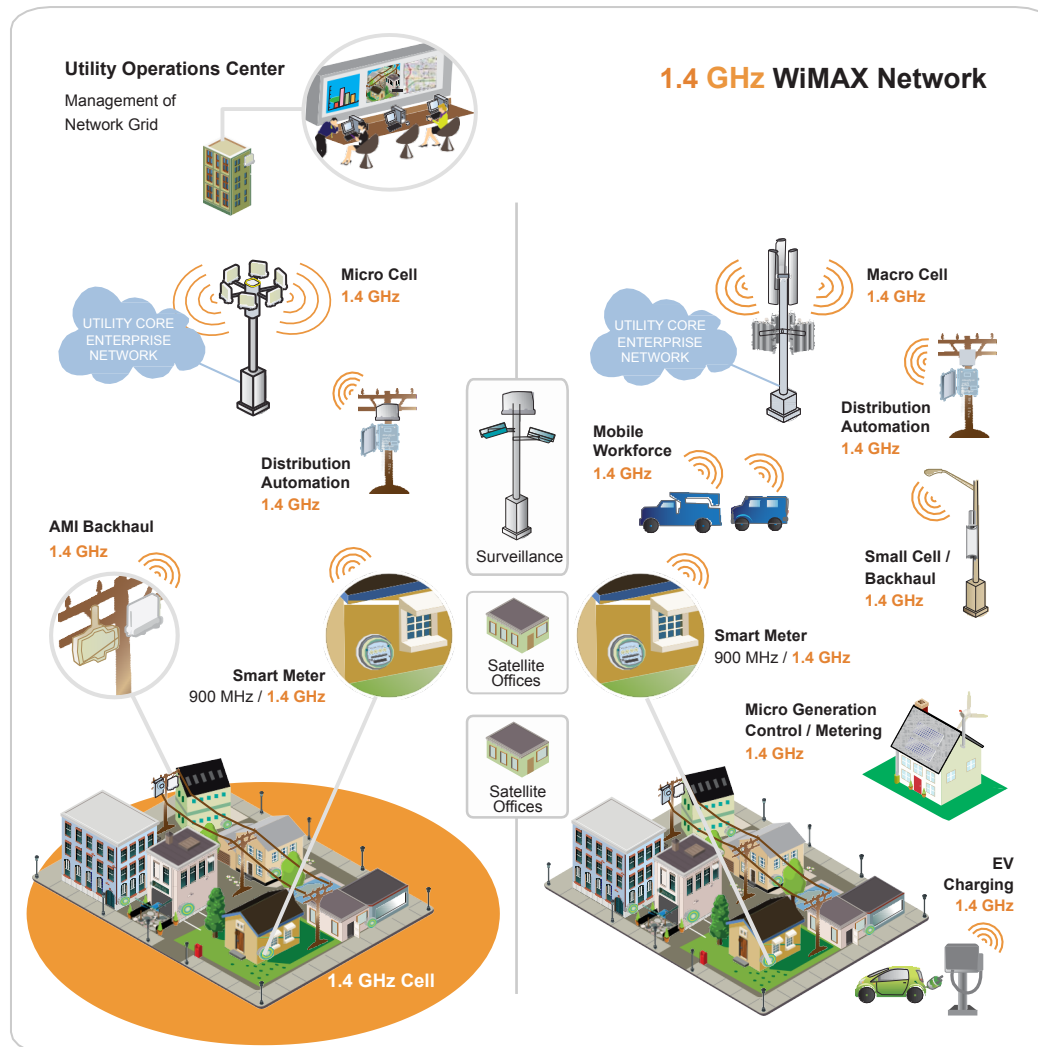
TerreStar and WMTS Allocations at 1.4 GHz

The commercial 1.4 GHz and WMTS bands sit directly adjacent to one another. While the proximity of both allocations initially represented a danger to patient safety, it ultimately enabled use of the commercial band by medical telemetry networks.



TerreStar WiMAX Smart Grid Solution at 1.4 GHz

Smart Grid has become a central element in electrical utility modernization. Supporting a full ecosystem, TerreStar 1.4 GHz is the only nationwide licensed broadband allocation suitable for dedicated Smart Grid service.

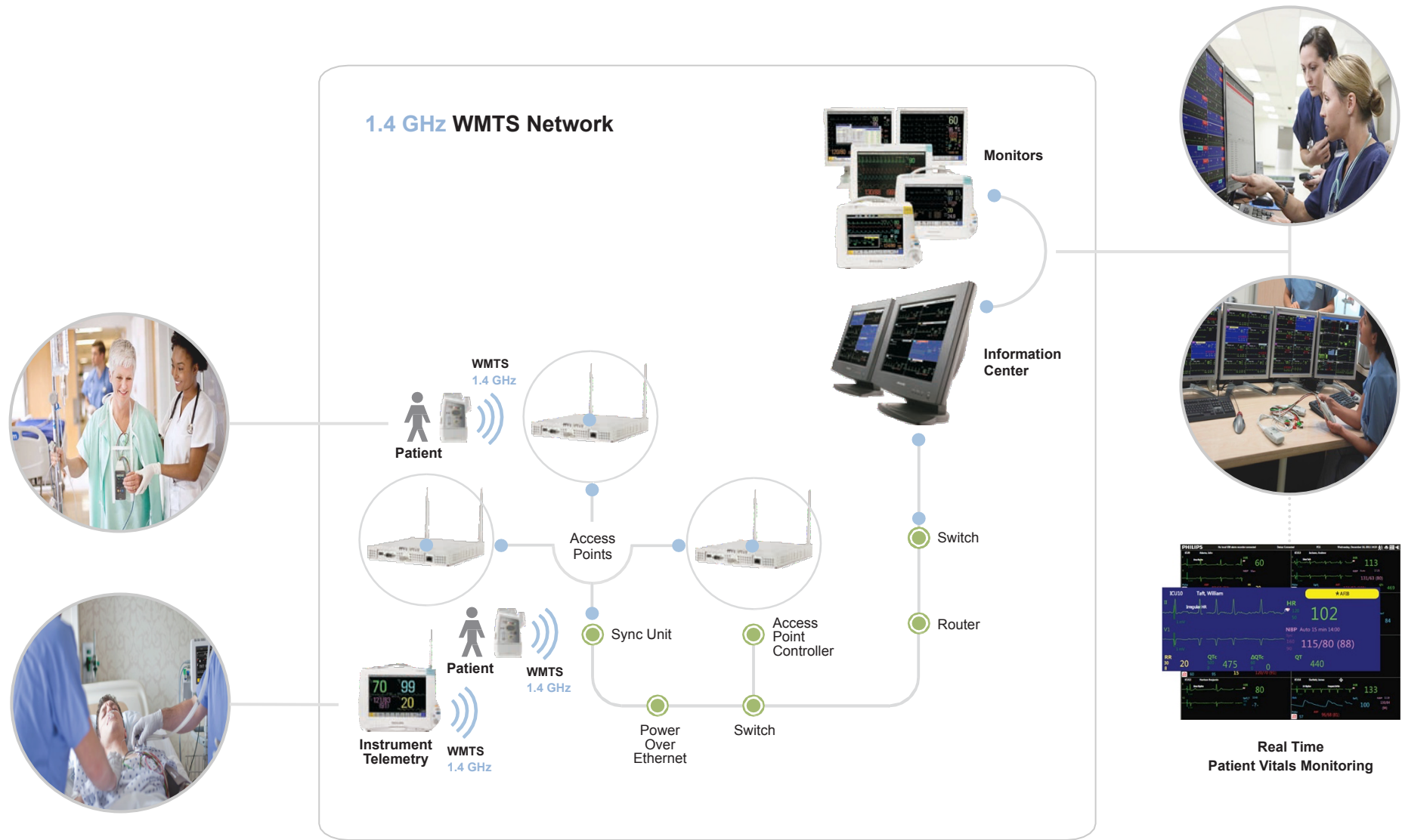


1.4 GHz WiMAX Ecosystem

- Base Station**
Airspan MicroMAX
- Mobile CPE**
Airspan MRT
- Portable Dongle**
Airspan MiMAX
- Indoor CPE**
Airspan MiMAX Easy
- Indoor / Outdoor Cell**
Airspan MiMAX Pro
- Base Station**
Airspan Air4G
- Base Station / Backhaul**
Airspan AirSynergy
- Base Stations / Nodes**
Cisco Connected Grid

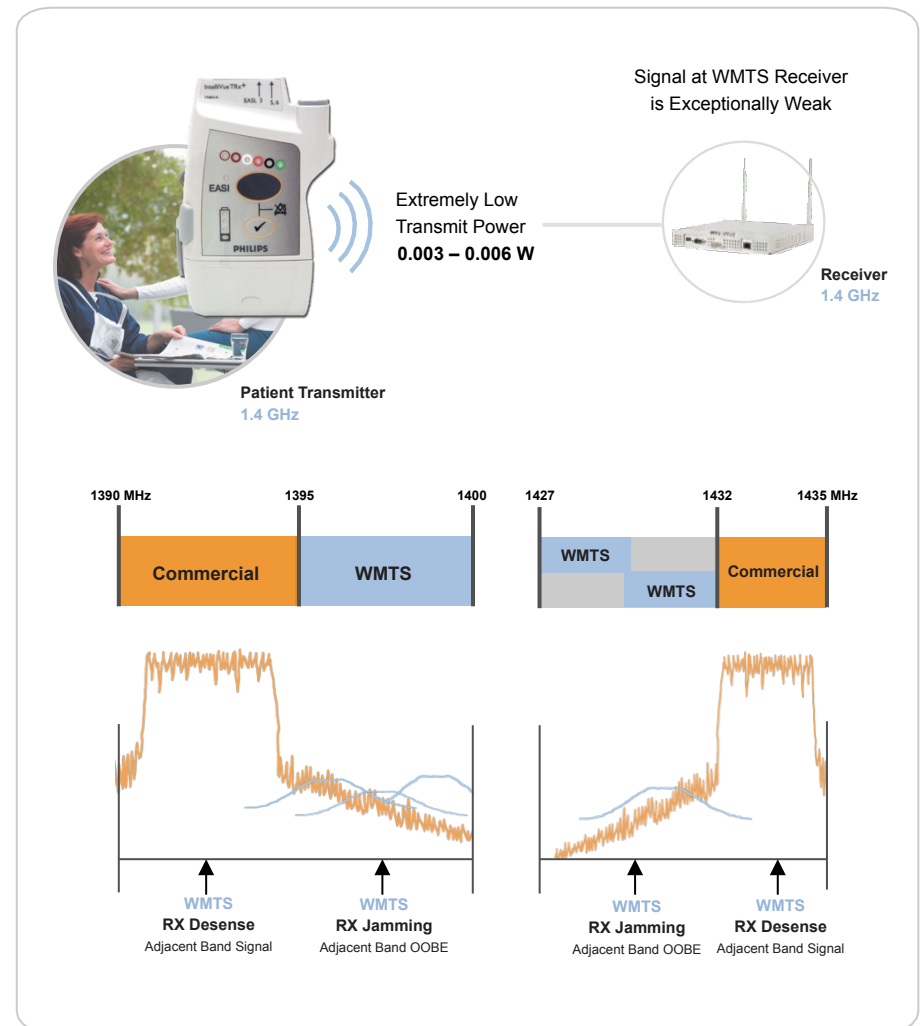
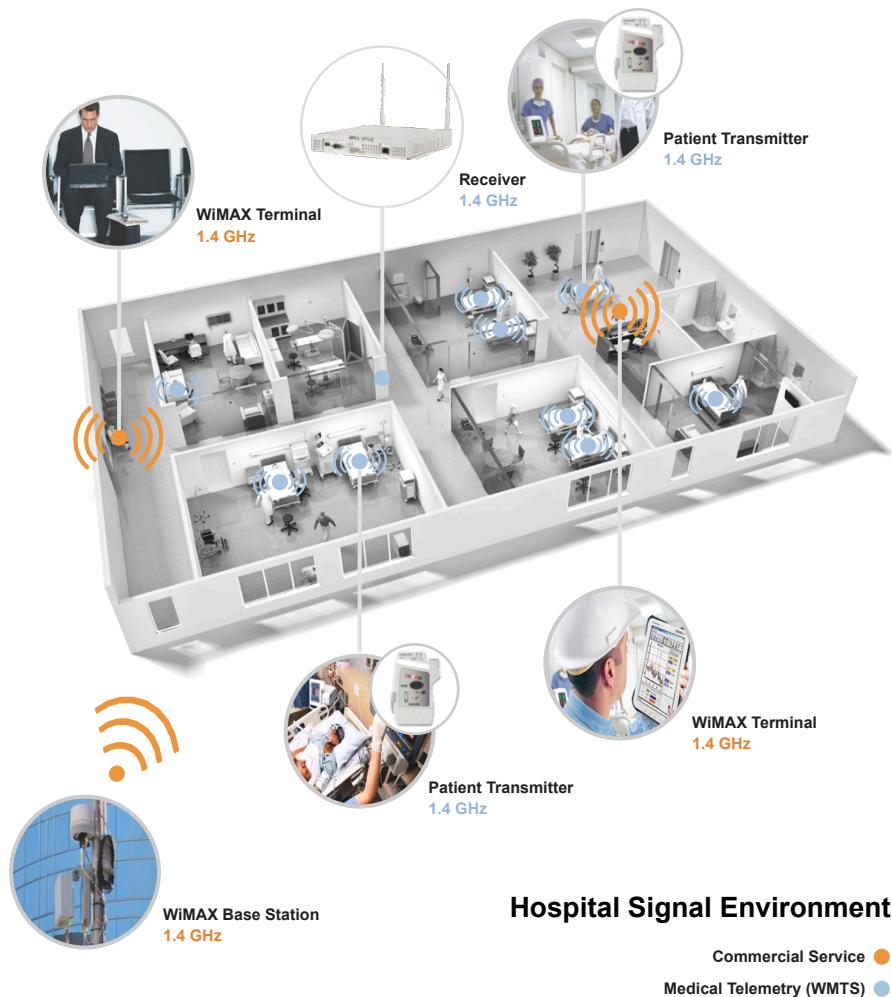
Wireless Medical Telemetry Service at 1.4 GHz

WMTS systems operating in the 1.4 GHz band provide life critical services at nearly 2,000 major healthcare facilities. Each day, WMTS at 1.4 GHz enables real time monitoring for more than 300,000 high risk patients.



Why WMTS at 1.4 GHz is Vulnerable to Interference

To ensure continuous 24/7 biometric telemetry with practical batteries, 1.4 GHz WMTS systems must use extremely low powers and high sensitivity receivers. This makes life critical patient monitoring networks vulnerable to current 1.4 GHz WiMAX equipment.

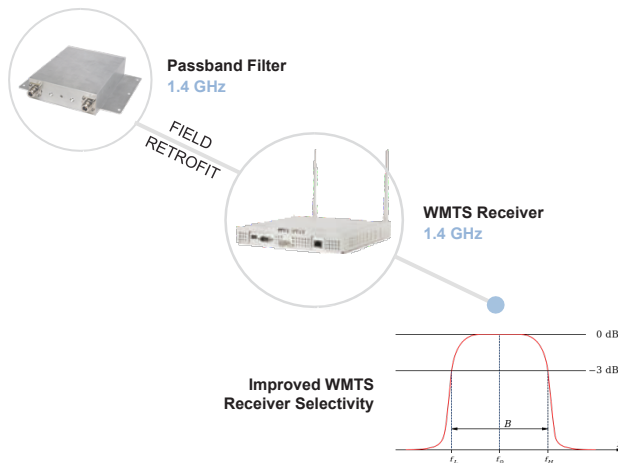


Attempts to Resolve 1.4 GHz WMTS Vulnerability

Once testing and analysis convinced TerreStar that its Part 27 compliant WiMAX emissions represented a serious danger to patient safety, the company aggressively pursued technical remedies ranging from filters to geographic exclusion zones.

Receiver Filtration Solution

Theoretical Implementation



Practical Challenges with Current Technology

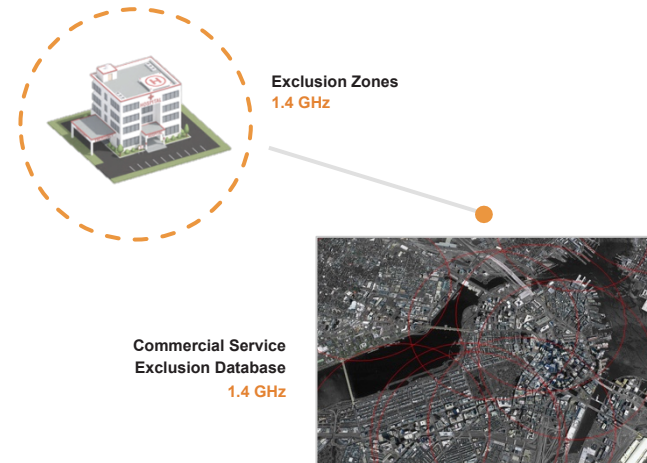
Logistics / Safety: WMTS equipment was not designed to accommodate external filters. Field modification would take years and disrupt life critical patient monitoring.

Engineering: Filters would not protect against out of band emissions, especially from mobile devices. Passband attenuation would degrade sensitivity of WMTS receivers.

NOT VIABLE

Exclusion Zone Solution

Theoretical Implementation



Practical Challenges with Current Technology

Economics: Even minimal exclusion zones (1 km) around approximately 3,800 registered WMTS facilities would cripple the commercial smart grid service across most of the populated land mass.

Engineering: Exclusion zones would not guarantee elimination of mobile terminal emissions within or near the medical facility. Testing indicated this to be the greatest threat to WMTS systems.

NOT VIABLE

Creation of a Commercial Medical Telemetry Application at 1.4 GHz

Unable to protect WMTS and still retain the commercial viability of its Smart Grid service, TerreStar developed an innovative medical telemetry solution. The company will use the software definability of WMTS devices to create a commercial medical telemetry application.

Current 1.4 GHz Medical Telemetry

Adjacent Band Interference Threat

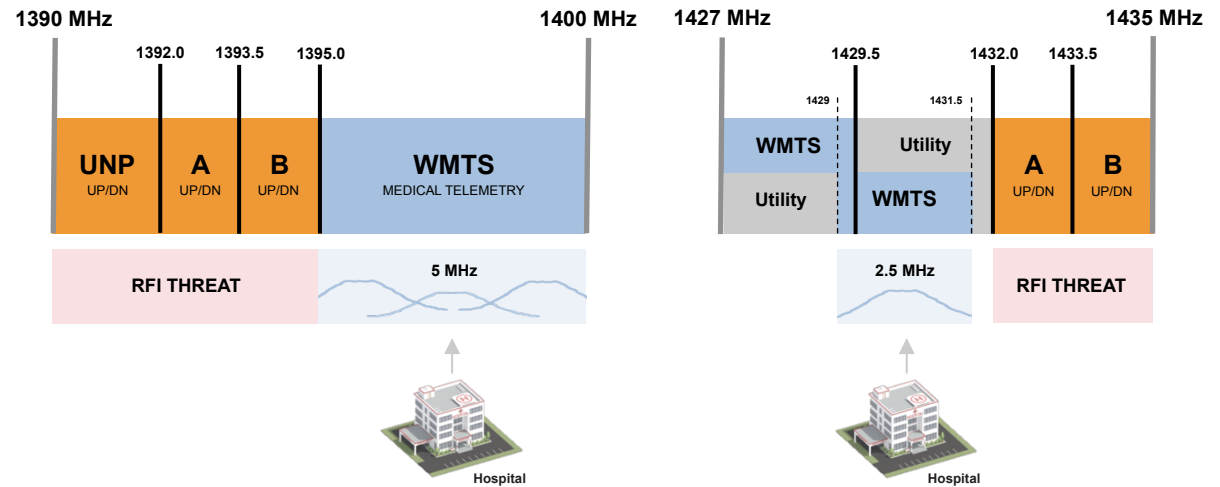
Severe

Patient Monitoring Spectrum in Hospitals

7.5 MHz

Patient Monitoring Spectrum Outside of Hospitals

0 MHz



Proposed Use of TerreStar 1.4 GHz

Adjacent Band Interference Threat

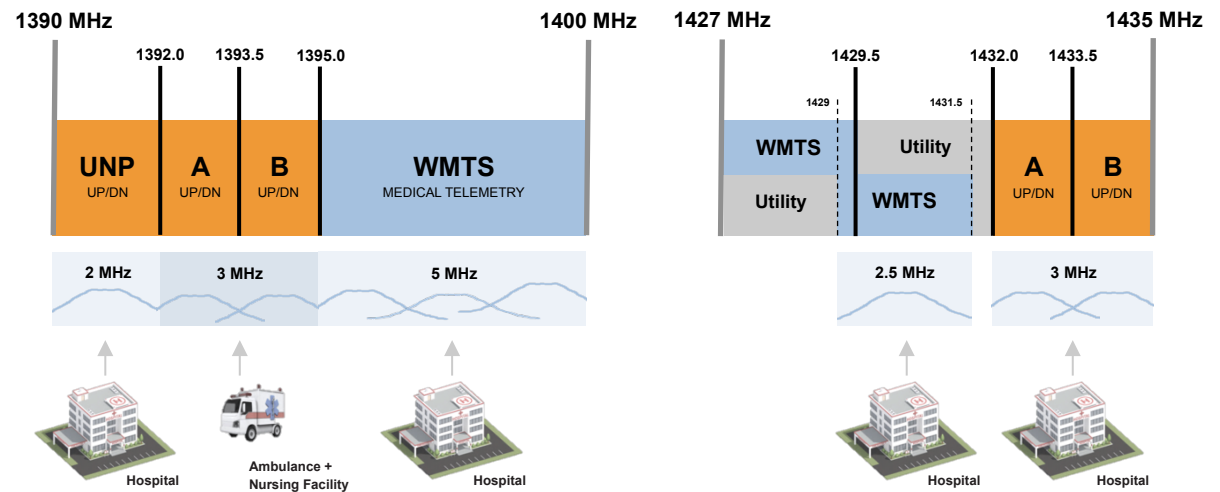
None

Patient Monitoring Spectrum in Hospitals

12.5 MHz

Patient Monitoring Spectrum Outside of Hospitals

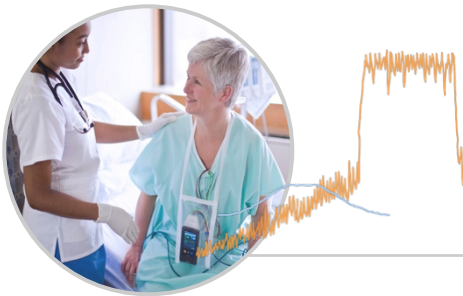
3 MHz



Impact of Commercial Medical Telemetry

TerreStar's commercial medical telemetry application will immediately expand WMTS capacity nationwide by at least 67%, while removing interference threats. Moreover, additional spectrum will be used for medical telemetry use cases not possible under WMTS rules.

Increased Patient Safety



- Removal of 802.16 WiMAX Interference Threat in the Adjacent Band
- Removal of Non-Medical Mobile Operations
- Additional Channel Capacity for Frequency Diversity

Expanded Interference Free Spectrum
for Life Critical Applications

Increased Network Capacity



- 12.5 MHz of Spectrum for Patient Monitoring in Hospitals (67% Increase)
- Immediately Needed Capacity to Cover Growing Patient Monitoring Load
- Increased Bandwidth for New Types of Advanced Patient Telemetry

Expanded Capacity for Growing Patient
Population and Advanced Monitoring

Increased Network Flexibility

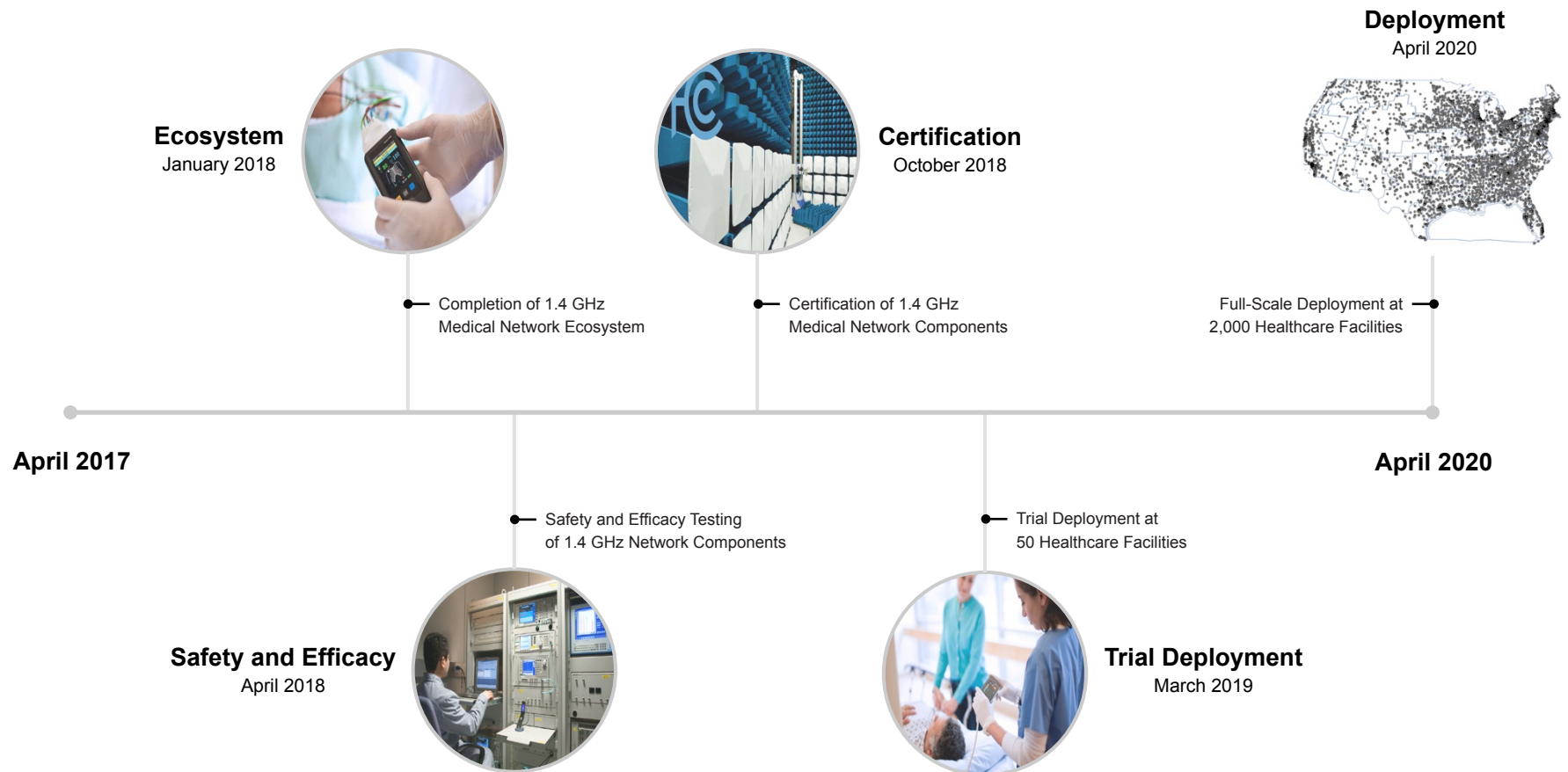


- Additional 3 MHz of Spectrum for Use Outside of Hospitals
- Ability to Operate in Ambulances, Nursing Facilities, and Rural Clinics
- Continuous Monitoring from Incident to Transport to Treatment

Life Critical Monitoring of Patients
in Places WMTS Cannot Operate

TerreStar's Implementation Plan for Medical Telemetry

Following more than two years of development, TerreStar plans to provide service to 2,000 hospitals within 36 months (more than 100% of the current 1.4 GHz footprint). Additionally, the company will enable medical services that go beyond existing Part 95 WMTS limitations.



Support from Medical Telemetry Stakeholders

Organizations responsible for the safety and long-term efficacy of WMTS support TerreStar's waiver request. They recognize that this service will eliminate interference threats while significantly expanding medical telemetry capacity.



"Commission grant of this waiver for a three-year period is in the public interest because it would allow the expansion of critically-needed patient health monitoring while avoiding the substantial potential for interference between incompatible systems in immediately adjacent spectrum."

"The interference potential of deploying WiMAX 802.16 systems adjacent to WMTS spectrum is very real and of significant concern to the WMTS community. Philips therefore welcomed the creative approach that TerreStar described in its Waiver Request."

"We are genuinely excited by TerreStar's proposal as submitted to the Commission. TerreStar's proposal is consistent with our discussions and has our full support because it provides a practical pathway to substantially improving patient care in the United States through wireless monitoring."

(WT Docket No. 16-290)

Philips Healthcare is the largest provider of 1.4 GHz Wireless Medical Telemetry Service networks, representing the overwhelming majority of registered deployments.



"The FCC has long recognized "the importance of the Wireless Medical Telemetry Service ("WMTS") to patient care" and the critical need to protect its "safety-of-life" operations from harmful interference."

"We agree with TerreStar that its plans to support wireless medical telemetry would not be feasible without a temporary waiver of its substantial service requirements. It could take up to three years for TerreStar, equipment manufacturers, and healthcare providers to develop, test, and deploy wireless medical telemetry systems that can viably operate on TerreStar's 1.4 GHz spectrum."

"...the number of locations that use WMTS is expected to increase significantly as hospitals seek to better address the problems raised by an aging U.S. patient population and increased patient acuities. Thus, there is a growing demand for WMTS spectrum to support remote patient monitoring. ...The Commission can help address this growing need for additional WMTS spectrum by granting TerreStar's request."

(WT Docket No. 16-290)

"The Commission can help address the growing need for additional wireless medical telemetry spectrum by, among other things, granting TerreStar's request to use its licensed spectrum to support wireless medical telemetry operations in the 1390-1392, 1392-1395, and 1432-1435 MHz bands. This additional spectrum would increase the capacity for such 1.4 GHz operations by approximately 67 percent. The spectrum is also well situated, as it is adjacent to two bands that are already used for WMTS."

(GN Docket No. 16-46)



"ASHE welcomes TerreStar's recognition of the vital importance of WMTS systems in significantly enhancing the standard of patient care. ASHE also appreciates TerreStar's recognition of the likely spectrum shortage facing WMTS licensees, and of the substantial benefit that can be realized by making the 1390-1395 MHz and 1432-1435 MHz bands available for use in WMTS systems."

(WT Docket No. 16-290)

"WMTS operations in the 1.4 GHz band also have proven to be a great success. The total number of deployments in the 1.4 GHz band has increased about 20% per year since 2013 with a total of over 8,000 deployments as of May 2017. ...Even though one manufacturer reports that its 1.4 GHz systems can support as many as 1,024 wireless monitoring devices, ASHE has heard anecdotally that some areas with a concentration of health care facilities are experiencing WMTS saturation due to a lack of 1.4 GHz spectrum."

"In that regard, ASHE welcomed the request of TerreStar Corporation for a temporary waiver of the FCC's substantial service deadline for TerreStar's commercial wireless licenses in the 1.4 GHz band adjacent to WMTS in order to expand medical telemetry capacity. Specifically, TerreStar's planned implementation of WMTS in the commercial 1.4 GHz band would extend medical telemetry services within health care facilities to the unpaired 1.4 GHz band (1390-1392 MHz) and upper 1.4 GHz A+B Blocks (1432-1435 MHz), and establish new medical telemetry services in the lower 1.4 GHz A+B Blocks (1392-1395 MHz)."

(GN Docket No. 16-46)